

REMARKS

This application has been carefully reviewed in light of the Office Action dated December 26, 2002 (Paper No. 11). Claims 1 to 26 are in the application, with Claims 24 to 26 having been newly added herein. Claims 1 to 4, 8 to 11, 17, 21, 24 and 25 are the independent claims. Reconsideration and further examination are respectfully requested.

The drawings were objected to under 37 C.F.R. § 1.84(p)(5). Specifically, the drawings were objected to for using the reference characters "S46" while the specification refers to "step 46." In response, Applicants have amended the specification to refer to "step S46" to correspond with the reference characters used in the drawings. Withdrawal of the objection to the drawings is therefore respectfully requested.

Claims 1 to 3, 17, 18, 21 and 22 were rejected under 35 U.S.C. § 102(b) over U.S. Patent No. 5,384,587 (Takagi); Claims 4 to 6, 11, 13, 14 and 17 were rejected under § 103(a) over Takagi in view of U.S. Patent No. 5,359,355 (Nagoshi); Claim 7 was rejected under § 103(a) over Takagi in view of Nagoshi and further in view of EP 0 516 420 (Arai); Claims 8 to 10 were rejected under § 103(a) over Takagi in view of Arai; Claim 12 was rejected under § 103(a) over Takagi in view of Nagoshi and further in view of U.S. Patent No. 5,488,398 (Matsubara); Claims 15 and 16 were rejected under § 103(a) over Takagi in view of Nagoshi and further in view of U.S. Patent No. 5,070,345 (Lahut); and Claims 19 and 23 have been rejected over Takagi. Applicants have considered the Examiner's comments together with the applied references and respectfully submit that the claims herein are patentably distinguishable over the applied references for at least the following reasons.

Independent Claims 1 to 3 concern recording on a recording material by ejecting ink with relative scanning movement between a recording head and the recording material. Information indicative of an amount of ink to be ejected to each of a plurality of unit areas provided by dividing an area in the neighborhood of a boundary between adjacent bands of scanning recording on the recording material is obtained and the amount of ink to be ejected to the unit areas is reduced on the basis of the obtained information. The unit areas exist astride the boundary between adjacent ones of the bands.

Independent Claim 4 concerns an ink jet recording apparatus for effecting recording on a recording material by ejecting ink using a recording head having a plurality of recording elements. The ink jet recording apparatus includes recording scanning means for effecting recording with relative scanning movement between the recording head and the recording material in a main scan direction and sub-scanning means for imparting relative scanning movement between the recording material and the recording head in a direction which is different from the main scan direction substantially each time after completion of a recording scan in the main scan direction. Dot count means counts an ink ejection data number for each of a plurality of unit areas provided by dividing an area in the neighborhood of a boundary between adjacent bands of scanning recording of the recording head on the recording material. A thinning rate is determined for each of the unit areas on the basis of the counted ink ejection data number and a thinning process is effected to the ink ejection data on the basis of the determined thinning rate. The unit areas exist astride the boundary between adjacent ones of the bands.

The applied references are not seen to disclose or suggest the foregoing features of the present invention. In particular, the applied references are not seen to

disclose or suggest at least the feature of reducing the amount of ink to be ejected or thinning the ink ejection data for unit areas which exist astride a boundary between adjacent bands of scanning recording.

Takagi concerns ink-jet recording in which scanned image areas are partially overlapped, with the overlapped portions being printed in two scans. In order to reduce the appearance of banding in the overlapped portions of the scanned image areas, Takagi controls the number of ink droplets ejected in each scan. As depicted in Figure 4 of Takagi, a fraction of the number of ink droplets to be ejected for the overlapped areas is ejected during each scan. However, the total number of ink droplets ejected for the overlapped areas is not reduced or thinned since the fraction of ink droplets not ejected during an initial scan is ejected during a subsequent scan. Therefore, Takagi is not seen to disclose or suggest at least the feature of reducing the amount of ink to be ejected or thinning the ink ejection data for unit areas which exist astride a boundary between adjacent bands of scanning recording.

Nagoshi is not seen to disclose or suggest anything to remedy the foregoing deficiencies of Takagi. Specifically, Nagoshi concerns ink-jet printing in which images are printed using a multi-pass print mode. Using the multi-pass print mode, Nagoshi prints a desired image by scanning a given region multiple times and printing a thin image during each scan. While a thin image is printed during each scan, since the resulting image is produced by multiple scans of the same region, the resulting image is not seen to be thinned. Therefore, Nagoshi is not seen to disclose or suggest at least the feature of reducing the amount of ink to be ejected or thinning the ink ejection data for unit areas which exist astride a boundary between adjacent bands of scanning recording.

Arai, Matsubara and Lahut, which were applied in the rejections of certain other claims in the application, are not seen to disclose or suggest anything to remedy the foregoing deficiencies of Takagi and Nagoshi. Specifically, Arai, Matsubara and Lahut, either alone or in combination with Takagi and Nagoshi, are not seen to disclose or suggest at least the feature of reducing the amount of ink to be ejected or thinning the ink ejection data for unit areas which exist astride a boundary between adjacent bands of scanning recording.

Accordingly, independent Claims 1 to 4 are believed to be allowable over the applied references. Reconsideration and withdrawal of the § 102(b) rejection of Claims 1 to 3 and the § 103(a) rejection of Claim 4 are respectfully requested.

Independent Claims 8 to 10 concerns effecting recording on a recording material with relative scanning movement between a recording head and the recording material. Information indicative of an amount of ink to be ejected to each of a plurality of unit areas provided by dividing an area in the neighborhood of a boundary between adjacent bands of scanning recording of the recording head is obtained and an amount of ink ejected to an area to be thinned in the unit areas is controlled on the basis of the obtained information. The sizes of the unit area and the area to be thinned are different from each other.

Independent Claim 11 concerns an ink jet recording apparatus for effecting recording on a recording material by ejecting ink using a recording head having a plurality of recording elements. The ink jet recording apparatus includes recording scanning means for effecting recording with relative scanning movement between the recording head and the recording material in a main scan direction and sub-scanning means for imparting

relative scanning movement between the recording material and the recording head in a direction which is different from the main scan direction substantially each time after completion of a recording scan in the main scan direction. Dot count means counts an ink ejection data number for each of a plurality of unit areas provided by dividing an area in the neighborhood of a boundary between adjacent bands of scanning recording of the recording head on the recording material. A thinning rate for each of the unit areas is determined on the basis of the counted ink ejection data number and thinning means effects a thinning process to the ink ejection data for an area to be thinned in the unit area on the basis of the determined thinning rate. The sizes of the unit area and the area to be thinned are different from each other.

The applied references are not seen to disclose or suggest the foregoing features of the present invention. In particular, the applied references are not seen to disclose or suggest at least the feature of the sizes of a unit area for which information indicative of an amount of ink to be ejected or an ink ejection data number is obtained and an area to be thinned in the unit area on the basis of the obtained information or ink ejection data number are different from each other.

Initially, Applicants note that with respect to Claims 8 to 10, the Office Action appears to argue that the applied references disclose or suggest that the “inks” of the unit area and the area to be thinned are different from each other. This feature is not currently claimed in the application. Rather, the claims currently claim the feature that the “sizes” of the unit area and the area to be thinned are different from each other.

Accordingly, should the rejection of these claims be maintained, Applicants respectfully request that the feature of different sizes of the unit area and the area to be thinned be addressed.

Turning to the references, none of the applied references, namely Takagi, Nagoshi, Arai, Matsubara, and Lahut, either alone or in combination, are seen to disclose or suggest at least the feature of the sizes of a unit area for which information indicative of an amount of ink to be ejected or an ink ejection data number is obtained and an area to be thinned in the unit area on the basis of the obtained information or ink ejection data number are different from each other.

Accordingly, independent Claims 8 to 11 are believed to be allowable over the applied references. Reconsideration and withdrawal of the § 103(a) rejection of Claims 8 to 11 are respectfully requested.

Independent Claims 17 and 21 concern effecting recording by ejecting ink onto a recording material on the basis of data using a recording head for ejecting the ink through a plurality of nozzles. Relative movement between the recording head and the recording material is controlled and ink is ejected from the recording head in accordance with ink ejection image data to sequentially effect recording operations for adjacent areas by the ink ejected from the recording head. Data indicative of ejection of the ink for boundary areas of adjacent recording areas is counted and the ejection data for the boundary areas is reduced.

The applied references are not seen to disclose or suggest the foregoing features of the present invention. In particular, the applied references are not seen to

disclose or suggest at least the feature of counting data indicative of ejection of ink for boundary areas of adjacent recording areas and reducing the ejection data for the boundary areas.

As discussed above with respect to Claims 1 to 4, none of the applied references are seen to disclose or suggest the feature of reducing the amount of ink to be ejected or thinning the ink ejection data for unit areas which exist astride a boundary between adjacent bands of scanning recording. Therefore, none of the applied references are seen to disclose or suggest the feature of counting data indicative of ejection of ink for boundary areas of adjacent recording areas and reducing the ejection data for the boundary areas.

Accordingly, independent Claims 17 and 21 are believed to be allowable over the applied references. Reconsideration and withdrawal of the § 102(b) rejection of Claims 17 and 21 are respectfully requested.

New independent Claims 24 and 25 are method claims corresponding to independent Claims 4 and 11, respectively, and are believed to be allowable over the applied references for at least the same reasons.

The other claims in the application are dependent from the independent claims discussed above and are therefore believed to be allowable over the applied references for at least the same reasons. Because each dependent claim is deemed to define an additional aspect of the invention, however, the individual consideration of each on its own merits is respectfully requested.

In view of the foregoing amendment and remarks, the entire application is believed to be in condition for allowance and such action is respectfully requested at the Examiner's earliest convenience.

Turning to a formal matter, on January 23, 2003, Applicants submitted a translation of Japan 11-188898, which was cited in the Information Disclosure Statement dated October 12, 2001. Applicants have enclosed herewith an updated form PTO-1449 reflecting that a translation of Japan 11-188898 has been submitted. Applicants respectfully request that the Examiner indicate that the translation of Japan 11-188898 has been considered by initialing the appropriate portion of enclosed form PTO-1449.

Applicants' undersigned attorney may be reached in our Costa Mesa, California, office by telephone at (714) 540-8700. All correspondence should be directed to our address given below.

Respectfully submitted,



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